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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,333	10/17/2003	Uri Cohen	JETS-02	2289

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EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 08/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/688,333	COHEN, URI	
	Examiner	Art Unit	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *13-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/26/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Status

1. The rejection grounds based on Dordi et al and/or Reynolds have been withdrawn in view of Applicant's amendment requiring that the application of ultrasonic or megasonic vibrations occurs prior to the start of electroplating. Neither Dordi et al nor Reynolds teaches or suggests applying the ultrasonic or megasonic vibrations during an initial wetting of the substrate.

Election/Restrictions

2. Newly submitted claims 13-20 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the method of claim 13 operates in a different manner than the methods of claims 1 and 7 since it does not include the step of immersing the substrate in an activation or wetting solution and applying ultrasonic or megasonic vibrations.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 13-20 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tzanavaras et al (US 5,421,987) in view of Downes, Jr et al (US 2002/0189637).

Tzanavaras et al teach (see figure 1) a method for electrofilling a metal or alloy inside at least one opening located in a front surface of a substrate, the front surface of the substrate including at least one opening and a top field surrounding the opening, wherein the opening included a bottom and sidewalls coated with an exposed metallic surface, wherein the steps of the method included immersing the substrate in an activation solution (electrolyte), applying high pressure electrolyte jets to the substrate, wherein the electrolyte included metallic ions of the metal to be plated and applying an electroplating current to the substrate to electroplate the metal inside the opening.

Thus, Tzanavaras et al fail to teach applying ultrasonic or megasonic vibrations to the substrate prior to the onset of electroplating.

Downes, Jr et al teach (see abstract and paragraphs 22, 30 and 39-41) applying ultrasonic vibrations to a liquid to ensure adequate wetting of small vias or holes with

Therefore, it would have been obvious to one of ordinary skill in the art to have added a step of applying ultrasonic vibrations to the substrate and electrolyte as taught

by Downes, Jr et al to the method of Tzanavaras et al because the ultrasonic vibrations would have increased wetting of the small vias and holes present on the substrates of Tzanavaras et al.

6. Claims 2, 4-5, 7, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tzanavaras et al (US 5,421,987) in view of Downes, Jr et al (US 2002/0189637) as applied to claim 1 above, and further in view of Langer et al (US 4,834,842).

The teachings of Tzanavaras et al, are described above.

None of these references expressly teach that the electrolyte plating bath included an inhibitor additive.

Langer et al (see abstract and col. 1, lines 18-34) a conventional additive for copper electroplating baths included inhibitors. The inhibitors were added to ensure a uniform deposit.

Therefore, it would have been obvious to one of ordinary skill in the art to have added an inhibitor as taught by Langer et al to the electrolyte of Tzanavaras et al because the inhibitor increased uniformity of the electroplated metal.

Regarding claims 4 and 9, Tzanavaras et al teach immersion of the substrate into the liquid electrolyte.

Regarding claims 5 and 11, Tzanavaras et al teach performing all the steps in a single chamber.

7. Claims 3, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tzanavaras et al (US 5,421,987) in view of Downes, Jr et al (US 2002/0189637)

and Langer et al (US 4,834,842) as applied to claims 2 and 7 above, and further in view of Hymes et al (US 6,423,200).

Tzanavaras et al fails to teach performing a preliminary activating treatment followed by wetting in the electrolyte.

Hymes et al teach (see figure 3A and col. 5, lines 32-56) that intermediate of a seed layer formation step and a copper electroplating step, an activation step is performed by etching the surface oxides existing on the copper seed layer to activate the seed layer to enhance the electroplating process.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed an activation step as taught by Hymes et al in an activation solution different from the electrolyte in order to remove surface oxides from the copper seed layer. In view of the teachings of Downes, Jr et al, it would have been obvious to one of ordinary skill in the art to have applied ultrasonic vibrations during this activation treatment in order to enhance the wetting of the copper seed layer within small vias and holes on the substrate to ensure adequate surface oxide removal.

Regarding claim 10, Hynes et al teach using a separate chamber (seed layer treatment module 204) for the activation treatment from the electroplating chamber (electroplating module 206).

8. Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tzanavaras et al (US 5,421,987) in view of Downes, Jr et al (US 2002/0189637) and Langer et al (US 4,834,842) as applied to claim 5 and 11 above, and further in view of Reynolds (US 5,904,827).

Tzanavaras et al fail to teach applying the ultrasonic vibrations during the electroplating treatment.

Reynolds teaches (see abstract, figure 3 and related description) including an megasonic transducer (90-92) for agitating the electrolyte in a copper electroplating process.

Therefore, it would have been obvious to one of ordinary skill in the art to have continued applying the ultrasonic vibrations to the substrate and electrolyte as taught by Reynolds to the method of Tzanavaras et al and Downes, Jr et al because the ultrasonic vibrations would have increased uniformity of the electroplating (see Reynolds at col. 8, lines 45-56).

Terminal Disclaimer

9. The terminal disclaimer filed on 26 June 2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent No. 6,869,515 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

10. Applicant's arguments with respect to claims 1 and 2 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry D Wilkins, III
Primary Examiner
Art Unit 1742

hdw